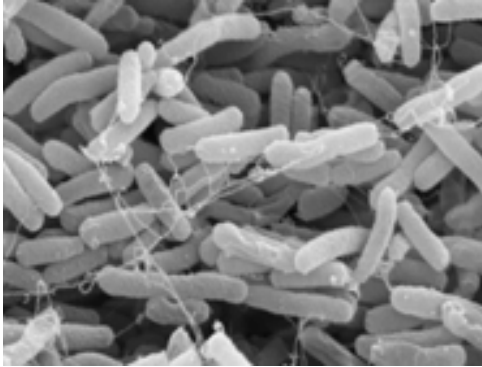


THE WATER USE CYCLE

HOW DO BACTERIA HELP TREAT WASTEWATER?



Bacteria are very small single cell organisms found throughout our environment. They are normal inhabitants of soil systems, aquatic environments and the intestinal tract of animals. Like all living organisms, bacteria require organic matter for food, access to water and appropriate temperatures. Most bacteria can decompose organic materials and receive nourishment in the process. Such bacteria “eat” decaying matter in soil and water systems and are critical in the turnover of organic matter in

ecosystems. Wastewater itself is full of organic material and nutrients. Bacteria can break down this organic material and obtain energy and building material for cell growth in a similar way that humans gain energy and material for growth from their food.

Wastewater treatment plants try to optimize this ability of bacteria to “eat” the organics in wastewater by providing ideal conditions for their growth and metabolism. After the major solids are removed from wastewater (*primary clarification*) the wastewater is sent to large pools such as an *aeration lagoon* or *oxidation ditch*. The wastewater is constantly stirred to help introduce oxygen and promote bacterial growth. This process is called *secondary treatment* and the mass of bacterial cells generated is called *activated sludge*. The bacteria will remove a good portion of the organic matter present in the wastewater, consuming oxygen and releasing carbon dioxide. This process of respiration is similar to human metabolism, where we breathe in oxygen and exhale carbon dioxide.



After a while the wastewater treatment plant will end up with a large amount of activated sludge (bacterial cell mass). Often the activated sludge is concentrated and placed in a large anaerobic digester designed to further treat the sludge using anaerobic bacteria.

These bacteria process organic matter in the absence of oxygen (*anaerobic* means without oxygen) producing methane gas and carbon dioxide as by-products. This process further breaks down the bacterial cell mass produced during secondary treatment and reduces its volume. The treated sludge is then often applied to farmland as a form of fertilizer in a manner similar to the practice of using horse manure in the household garden.

TRICKLING FILTERS

Some treatment plants elect to use a trickling filter system rather than an aeration lagoon to provide secondary treatment. Trickling filters allow the wastewater to *trickle* down over a column of support media (usually rocks or specially designed plastic supports blocks). Bacteria will grow on the support media and metabolize the wastewater that flows through the system. *For more information on trickling filters see fact sheet in this section.*